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APPENDIX [in Volume II]

5.0 TRANSMISSION FACILITIES

This section describes the project's transmission facilities proposed to interconnect the power plant with the PG&E transmission system located directly adjacent to the proposed power plant. Final design will be by PG&E, who will own and operate the transmission facilities.

5.1 INTERCONNECTION TO TRANSMISSION GRID

Generation from the CGS will be delivered to PG&E's high-voltage transmission grid. The CGS will be interconnected with PG&E's transmission grid by looping the four north-south 230 kV Cottonwood to Vaca-Dixon lines into the CGS switchyard. The corridor containing the existing Cottonwood to Vaca-Dixon lines is located approximately 1,800 feet east of the CGS site.

A conceptual diagram showing the proposed interconnection is shown on Figure 5.1-1. This diagram shows the four existing 230 kV circuits that begin at Cottonwood. One of the circuits is routed directly to Vaca-Dixon. The other three are connected to intermediate substations as shown on Figure 5.1-1.

To interconnect the CGS, each of the four circuits will be looped from the transmission corridor into the CGS switchyard and then back to the transmission corridor as shown on Figure 5.1-1. Each of these loop lines will be approximately 1,800 feet in length. A total of eight new circuits will be constructed between the transmission corridor and the new switchyard (four in and four out of the switchyard). Two circuits are carried on each tower line, so there will be four tower lines between the transmission corridor, as shown on Figure 3.3-1, Site Plan. All eight circuits are within the transmission corridor adjacent to the project site.

The eastern end of the transmission line interconnection, where it connects to the existing transmission lines, passes through an area that contains a few diffuse vernal pools. Transmission line towers will be sited to completely avoid direct impacts to vernal pools. A 10,000-square-foot disturbance area is estimated per tower. One transmission tower would be located near the vernal pools. For this particular tower, disturbance will be minimized to ensure that the nearby vernal pools are not affected. Vehicular access will be outside of any wetland areas, and located far enough from wetlands so that there is no temporary disturbance during construction. Any regular maintenance that requires vehicular access will occur between June 15 and October 1, when the area is dry. Vehicles used in this area will be in good condition, and will not leak oil, gas, or other fluids. See Section 8.2, Biological Resources, for more details on measures proposed to minimize potential impacts from the transmission line interconnection.

E&L Westcoast has filed an application for interconnection of the plant with PG&E. E&L Westcoast has also prepared a System Impact Study and Facilities Study Report, which has been included in Appendix F. Initial results of this study show that interconnection of the CGS reduces the real and reactive system losses, thus improving area transmission voltage levels and the reactive margin. The new generation also eliminates the need for load shedding of particular multiple contingency conditions.

5.2 INTERCONNECTION CONFIGURATION

5.2.1 Structures

Twelve new double-circuit lattice steel transmission towers will be installed to accommodate both the looping of PG&E's 230 kV lines into the plant switchyard and for the connections from the generator step-up transformers to the plant switchyard.

Figure 5.2-1 shows a double-circuit lattice tower structure to which the conductors are attached. The structure height above grade is 100 to 125 feet but may vary depending on configuration of the site terrain.

5.2.2 Conductors

The selection of conductor for looping PG&E's 230 kV lines into the plant switchyard will be based on matching the rating of the existing circuits with some additional capacity to accommodate possible future use of these lines. The conductor that will meet these requirements is 954 MCM AAL and 954 MCM ACSR. This conductor is expected to carry the full current output of the power plant, and is proposed for connecting the generator collector bus and switchyard.

5.2.3 Foundations

Foundations for the transmission line structures consist of single concrete piers reinforced as necessary to withstand design loads. These are formed by augering a hole of appropriate diameter and depth, placing a cage of reinforcing steel in the augered hole, and filling the hole with high-strength concrete to the appropriate elevation. Single-circuit tower structures may be direct-buried rather than installed on foundations.

5.3 ELECTROMAGNETIC FIELD/RADIO-TELEVISION INTERFERENCE

The electrical transmission interconnection and other electrical devices that will be constructed as part of the CGS emit electromagnetic fields (EMF) when in operation. These fields are typically measured near ground level where they are encountered by people. In addition, operation of electrical transmission lines can cause interference with radio and TV signal reception.

As described in the previous section, interconnection of the CGS to the PG&E transmission system will require looping the existing Cottonwood to Vaca-Dixon transmission lines into the new Colusa Generating Station switching station. These additions to the transmission system will not be in a fenced area and thus have uncontrolled access.

Interconnection of the CGS into the PG&E transmission system will also modify the power flows on the PG&E Cottonwood to Vaca-Dixon transmission circuits. Since EMF is related to power flow, interconnection of the CGS will modify the EMF generated by the existing transmission lines.

Finally, EMF fields, to the extent they occur, could impact receptors on the properties adjacent to the proposed project. In addition, radio and TV interference could occur at nearby residences.

As shown on Figure 3.3-1, Site Plan, the plant site will be enclosed by a security fence. Site access will be limited to station workers, incidental construction and maintenance personnel, other company personnel, regulatory inspectors, and approved guests. Since access is not available to the general public, general public exposure to EMF is not expected to occur from the CGS facility or switchyard itself.

Calculation of electric and magnetic field strength was performed for an area covering one square mile. The area encloses the entire project site, including the new transmission line requirements and sections of the existing PG&E lines that were looped into the proposed site. The analysis was performed using the following assumptions:

- Double Circuits – three-phase vertical cross-phased configurations
- Transmission phasing and loading as shown in Table 5.3-1
- Minimum Conductor Height – 45 feet above ground
- Horizontal spacing between conductors on tower centerline – 14.5 feet
- Vertical Spacing between conductor phases – 16.5 feet

The line loading for each circuit is shown in Table 5.3-1.

It has been determined that the nearest television or radio receptor is located approximately 1.7 miles from the proposed site. Radio and television interference is therefore negligible due to the distance between the proposed site and nearest receptor.

These results of the EMF analysis are shown in Table 5.3-2, and indicate that the maximum magnetic fields seen after the addition of the E&L Westcoast, LLC Colusa project are located where the existing four 230 kV lines are cut and looped into the CGS switchyard. Table 5.3-2 shows magnetic and electric fields generated by the existing PG&E transmission system and the interconnection to the CGS. It shows the fields generated under existing maximum line loading and after addition of the CGS. It also shows the field strengths at a point 250 feet away from the lines.

The highest value calculated was 85.0 milligauss (mG) at the point of intersection of the PG&E transmission lines and the new lines looping into the new CGS switchyard. The corresponding maximum electric field at this location was 0.88 V/m. As one moves away from this location, both fields degrade rapidly. For example, at a distance of 250 feet from the point of maximum field strength, the magnetic field is reduced to 3.8 mG.

The results show how all of the fields degrade rapidly with distance from the lines. Since the nearest permanent residence is approximately 1.7 miles from the proposed project, magnetic and electric fields generated by the transmission lines are essentially negligible both before and after development of the CGS.

5.4 CONSTRUCTION

Construction of the interconnection between the existing Cottonwood to Vaca-Dixon transmission corridor at the CGS will be undertaken by PG&E. Construction will be scheduled to occur after the CGS switchyard has been completed. This will allow each transmission circuit to be placed back in service immediately after it is interconnected to the CGS switchyard. The construction of the loop lines will be phased to minimize coincident outages of parallel circuits.

Construction of the loop lines is estimated to include disturbance at 24 locations where excavation for tower locations will occur and towers will be installed. Wheeled vehicles for transportation of conductor spools, and line pulling and tensioning equipment will traverse the transmission line construction area.

Equipment laydown for transmission construction will use a portion of the cleared equipment laydown area for the power plant. Construction of the electrical interconnection will take approximately 9 months and will occur from Months 6 to 14. Peak workforce for the tower and line work will be approximately 20 people. Staff for the construction of the electrical interconnection lines are included in Table 3.6-1. The electrical interconnection workforce will consist of electricians, iron workers, laborers, equipment operators, supervisors, and inspectors.

5.5 TRANSMISSION SYSTEM UPGRADES BEYOND POINT OF FIRST INTERCONNECTION

A System Impact Study (Navigant, 2005) was conducted to determine system impacts caused by the addition of the project on PG&E's transmission grid and on those portions of the transmission grid in Northern California owned by Western Area Power Administration (WAPA), the Sacramento Municipal Utility District (SMUD), and the Transmission Agency of Northern California (TANC). The System Impact Study is included in Appendix F. The study identified:

- The transmission system impacts caused solely by the addition of the proposed project; and

- The system reinforcements, if any, necessary to mitigate the adverse impact of the proposed project under various system conditions.

Table 5.5-1 identifies the impacted facilities and proposed mitigation alternatives for all noted Category A and Category B contingency overloads, all of which fall outside the scope of CEC's review of CGS. E&L Westcoast acknowledges that the proposed mitigations listed in Table 5.5-1 will need to occur prior to the CGS in-service date. The status of these mitigations is summarized below.

ISO-Controlled Facilities

A 2006 Facilities Study Report (PG&E, 2006) indicates that the project would cause no new Category A normal overloads and no new Category B emergency overloads on PG&E facilities that will require mitigation by the project. The Facilities Study Report is provided in Appendix F. The report states that the CGS project would be responsible for mitigating project-related impacts on the following two PG&E projects if they were not complete by the CGS project in-service date: (1) reconductoring the Palermo-Bogue and Palmero-East Nicolaus 115 kV lines by 2007, and (2) installing a second 230/115 kV transformer at the Palermo substation by 2007.

PG&E indicated that an environmental evaluation is currently being conducted of the Palermo-Bogue-East Nicolaus reconductoring project and the earliest in-service date is expected to be at the end of 2008 or early May 2009. The Palermo substation transformer is arriving sometime early next year and the in-service date is expected in May 2007 (Marki, 2006). Based on communication with PG&E, these two PG&E projects are underway and would be completed by the CGS in-service date.

Non-ISO Controlled Facilities

The System Impact Study determined that operation of the CGS impacted WAPA and SMUD facilities as follows:

1. Increased pre-project base case and Category B and C contingency overloads on WAPA's O'Banion-Elverta 230-kV lines.

2. Increased pre-project Category B and C contingency overloads on SMUD's Hurley-Carmichael line.

3. Resulted in new Category C contingency overloads on WAPA's Olinda-Keswick line and WAPA-SMUD tie at Elverta.

4. Resulted in one Category B contingency overload on the Olinda 500/230-kV transformer during spring off-peak conditions and increased one pre-project Category C contingency overload on the transformer during summer off-peak conditions.

5. Increased pre-project Category B overloads on the Shasta-Flanagan-Keswick lines during summer peak conditions.

All or portions of overloads numbered 1 through 3 above will be mitigated by projects underway by WAPA and/or SMUD, as discussed below. In addition, because the CGS would likely not be operating at its maximum output during spring off-peak load conditions, it was determined in the System Impact Study that overload on the Olinda-Keswick line (item 3 above) was a very low probability that did not warrant specific mitigation.

The following further describes the projects that mitigate overloads caused by the CGS on non-ISO controlled facilities.

O'Banion-Elverta Line Project: This project includes constructing a new approximately 26-mile-long, double-circuit, 230-kV transmission line from the O'Banion substation to the Elverta and Natomas substations. The proposed upgrades would mitigate the aforementioned overloads to the O'Banion-Elverta line (item 1 above) and Elverta tie (item 3 above). This project is being evaluated in the Sacramento Area Voltage Support Supplemental Environmental Impact Statement (EIS) and Environmental Impact Report (EIR) currently being prepared by WAPA, SMUD, and the City of Roseville. WAPA had prepared a Draft EIS for the project in November 2002 and a final EIS in September 2003. A Record of Decision was signed in January 2004. In the Record of Decision, WAPA made a commitment to conduct air, biological, and cultural surveys after funding was secured. SMUD and the City of Roseville have since committed to share the cost in conducting more detailed project studies and are negotiating funding for the construction of this project. The official scoping period for the Supplemental EIS and EIR is complete. WAPA has indicated that the Draft Supplemental EIS and EIR release date is expected in April 2007, Final Supplemental EIS/EIR in December 2007, and the Record of Decision is expected in April 2008 (Mirzadeh, 2006).

The anticipated in-service date for this project has not yet been identified. CGS will work with WAPA to develop a project funding agreement that may include design and construction of this project should the current funding agreement is not in place by the scheduled commercial operation of the CGS project.

Folsom-Loop Project: This project would consist of expanding WAPA's Folsom 230-kV substation and looping SMUD's existing Orangeville-Lake 230 kV line into the expanded substation via two short tie lines. This project would mitigate overload to the Hurley-Carmichael line (item 2 above). SMUD is currently preparing the environmental evaluation for relocating the SMUD line adjacent to the WAPA's existing substation. The CGS project would then only require construction of the two tie-ins that will loop the SMUD's Lake – Orangevalle 230-kV line in and out of Western's Folsom substation. The environmental evaluation for relocating the above SMUD line to a location adjacent to the WAPA substation is currently underway by SMUD, but this evaluation does not include SMUD's tie in to the WAPA substation.

The loop or tie-in would require expansion of the existing switchyard and may require involvement of the Bureau of Reclamation who owns the adjacent land in case the vacant space in the existing Western 230-kV substation is not adequate for the looping of the SMUD Lake – Orangevale 230-kV line. Due to the small magnitude of the tie-in activities, however, environmental concerns are expected to be minimal. SMUD and WAPA will coordinate the effort for the tie in at a later date; it is expected that the looping/tie in may be categorically exempt under CEQA and categorically excluded under the National Environmental Policy Act (NEPA) (Mirzadeh, 2004; Larsen, 2006; DeBerry, 2006). The anticipated in-service date for this project has not yet been identified.

CGS will work with WAPA and SMUD to develop a project development agreement that will include planning, design and construction of this project by the scheduled commercial operation of the CGS project.

Olinda Transformer Remedial Action Scheme: This project would include re-setting of (1) existing metering equipment to detect an overload on the transformer, and (2) existing communications equipment to send a signal to the CGS indicating that it should cut back its production. This project would mitigate item 4 above. This project will utilize existing electronics equipment and will not require expansion of the existing facility. It is expected that this project will be categorically exempt under CEQA (Larsen, 2006).

Shasta-Flanagan-Keswick Line Project: Mitigations of the overloads on the 8.75-mile Shasta-Flanagan-Keswick lines would require that the lines be reconductored (item 5 above). WAPA owns these lines and its Transmission Line Design and Environmental Divisions are currently working to develop a

more detailed scope of work for reconductoring. WAPA has not yet conducted the technical evaluation to determine the detailed scope of work for the reconductoring activities. WAPA will conduct its own environmental review of the reconductoring as part of its approval process. According to WAPA, the preliminary evaluation indicates that the reconductoring efforts would likely be categorically excluded under NEPA (Mirzadeh, 2006).

5.6 REFERENCES

DeBerry, Donald, Sacramento Municipal Utilities District. 2006. Personal communication with K. Rushmore of URS Corporation. September 25.

Larsen, Dave, Navigant Consulting. 2006. Personal communication with K. Rushmore of URS Corporation. August 22.

Marki, Tom, PG&E. 2006. Personal communication with K. Rushmore of URS Corporation. August 1.

Mirzadeh, Mariam, Western Area Power Administration. 2006. Personal communication with K. Rushmore of URS Corporation, June 19.

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PG&E (Pacific Gas and Electric Company), 2006. Facilities Study Report, Generation Interconnection, CPV Colusa Project. February 28.

Table 5.3-1
Transmission Circuit Line Loading

Transmission Lines on Same Tower	Phasing Sequence (Top to Bottom)	Line Amps
Cottonwood-E&L Westcoast, LLC Colusa No. 2 230 kV Logan Creek-E&L Westcoast, LLC Colusa 230 kV	ABC CBA	213.8 148.4
Cottonwood-E&L Westcoast, LLC Colusa No. 1 230 kV Glenn-E&L Westcoast, LLC Colusa 230 kV	ABC CBA	208.6 79.2
E&L Westcoast, LLC Colusa-Cortina 230 kV E&L Westcoast, LLC Colusa-Vaca Dixon No. 2 230 kV	ABC CBA	743.0 470.3
E&L Westcoast, LLC Colusa-Vaca Dixon No. 1 230 kV E&L Westcoast, LLC Colusa-Vaca Dixon No. 3 230 kV	ABC CBA	454.7 454.7

Table 5.3-2
EMF and Electric Fields

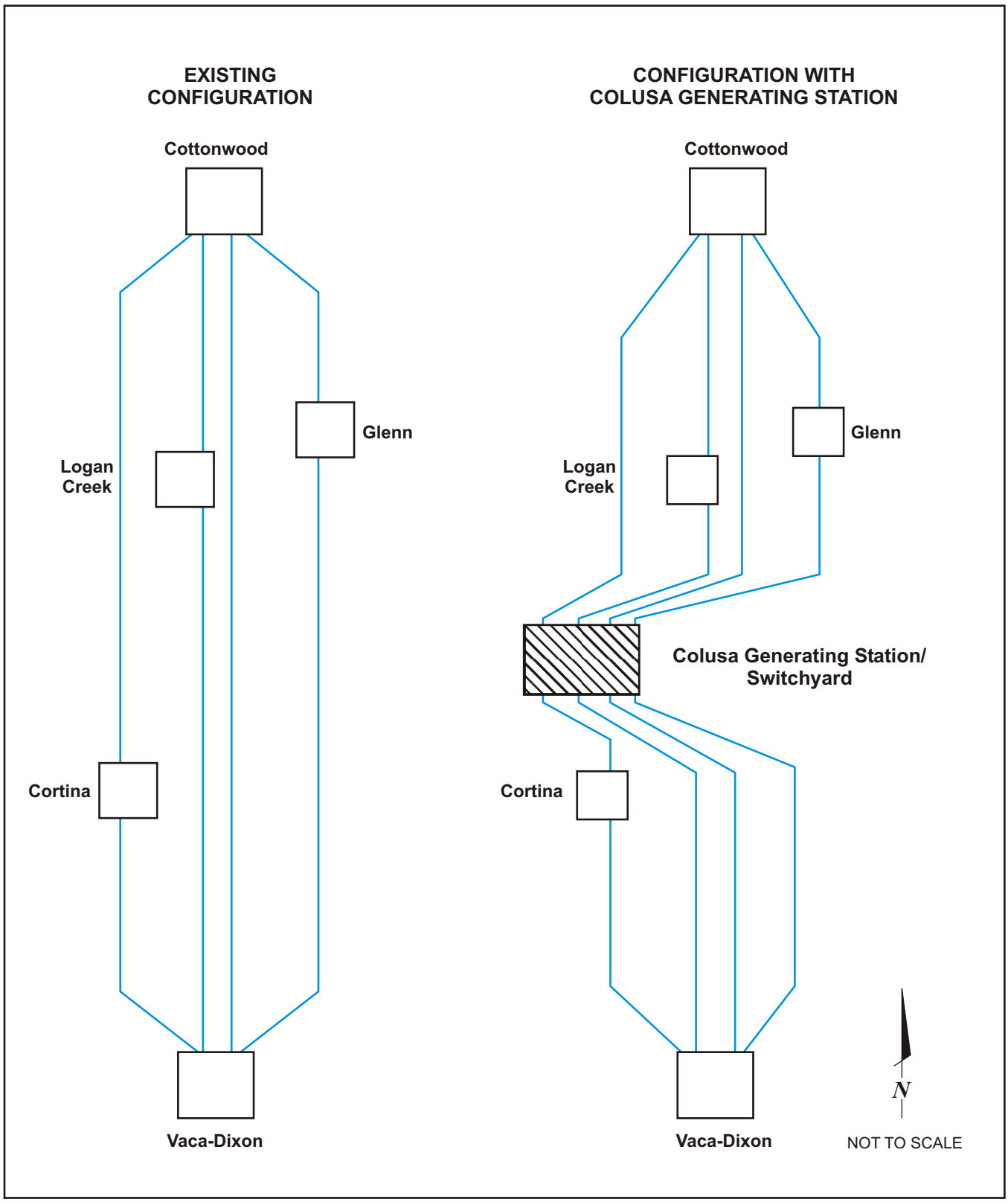
		PG&E Transmission Lines								CGS Interconnect				Maximum Value	
		Circuits Before		North After		Circuits Before		South After		Before		After			
	Units	Max	250′	Max	250′	Max	250′	Max	250′	Max	250′	Max	250′	Max	250′
Magnetic Field	MG	15.0	1.94	11.2	1.3	15.0	1.94	43.9	2.6	NA	NA	39.9	4.46	85.0	3.8
Electric Field	V/m	0.9	0.034	0.9	0.034	0.9	0.034	0.9	0.034	–	–	0.88	0.20		

Note:
250′ = at a distance of 250 feet.

Table 5.5-1
Summary of Proposed Mitigation Options for Category A and Category B Overloads

Overloaded Component	Critical Case	Rating (Amps/MVA)	Worst Case Loadings		Proposed Mitigation
			Pre-Project	Post-Project	
ISO-Controlled Facilities					
CPV Colusa-Cortina 230 kV Line	Summer Peak	954 (Emergency)	N/A	100 percent	None required
Lambie-Birds Landing 230 kV Line	Summer Peak	954 (Emergency)	85 percent	100 percent	None required
Palermo 230/115 kV Transformer	Summer Peak	168 (Emergency)	109 percent	111 percent	Install second transformer (PG&E Project #T686B)
Palermo-E. Marysville Jct 2 115 kV Line	Summer Peak	357 (Normal) 412 (Emergency)	102 percent 104 percent	103 percent 106 percent	Reconductor Palermo-Bouge and Palermo-East Nicolaus 115 kV lines (PG&E Project #T686)
Non-ISO Facilities					
Olinda 500/230 kV Transformer	Spring Off-Peak	1,041 (Emergency)	90 percent	106 percent	Install a second transformer at Olinda or use remedial action schemes (RAS) to drop the Project generation for the critical 500 kV contingency (Captain Jack-Olinda)
O'Banion-Elverta 230 kV Lines	Summer Peak	1,054 (Normal) 1,054 (Emergency)	100 percent 115 percent	103 percent 120 percent	New O'Banion-Elverta 230 kV lines that have been proposed by WAPA
Flanagan-Shasta 230 kV Line	Summer Peak	800 (Emergency)	123 percent	126 percent	Initiate discussions with WAPA to identify required modifications and/or upgrades
Flanagan-Keswick 230 kV Line	Summer Peak	800 (Emergency)	109 percent	113 percent	
Hurley S-Carmichael 230 kV Line	Summer Peak	880 (Emergency)	107 percent	109 percent	Initiate discussions with SMUD to identify required modifications and/or upgrades

Notes:
Ratings in Table 1-1 and subsequent Tables are in MVA for transformers and amps for lines
The emergency ratings for WAPA's 230 kV lines in the powerflow data sets are the same as the normal ratings



LEGEND

- Existing Substation
- New Colusa Generating Station Switchyard
- 230 kV Transmission Circuit

INTERCONNECTION TO THE COTTONWOOD TO VACA-DIXON 230 kV TRANSMISSION SYSTEM

28067004
November 2006

Colusa Generating Station
E&L Westcoast, LLC
Colusa County, California

URS

FIGURE 5.1-1

10/19/06 vsa ..\28067004 CPV Colusa\5.0 Transmission\5.1-1_interconnect.cdr